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fungus on the leaves alone, it would appear to be the *Tilletia bullata* of Fuckel, referred by Schroeter in Cohn's *Beit. zur Biol.*, vol. II, p. 355, to *Ust. Bistortarum* (D. C.). Prof. Bessey's specimens on leaves agree well with Schroeter's description. A question may arise as to the species when we consider its appearance on the flowers. In *Ust. Candollei*, Tul., closely related to *Ust. Bistortarum*, the ovaries are distorted so that they project like columns from the perianth, but in the specimens collected both by Prof. Bessey and Mr. Halsted, the distortion is still greater. The ovaries are all transformed into more or less globular hard masses and, as nearly all the flowers of a spike are affected, the masses coalesce, forming a compact cylinder with a nodulated surface in which the individual flowers can hardly be recognized. The color of the spores, both in the form on the flowers as well as that on the leaves, is hardly purple but more nearly brownish than in *Ust. Candollei*. While referring the species to *Ust. Bistortarum* (D. C.), it will be seen that there are several points in which the American plant does not exactly agree with the European form. The form on the leaves, I would add, is much like Libert *Plant. Crypt. Ard.*, No. 88.

W. G. FARLOW.

"Thistledown." ¹

A STUDY.

As a child, have you not held gently poised twixt thumb and finger the airy, fleecy thistledown, then lightly blowing watched the tiny parachute as it sailed away? It is a delicate, cunning device, lighter and more buoyant than a bird's feather, smaller and finer than the moth's antennæ.

When separated from the achene, it consists of plumelike filaments attached to a ring. Its mode of attachment to the seed is peculiar. The upper end of the achene is grooved, thus leaving a small projecting edge of the calyx. Into this groove fits a minute ring—large enough to slip upon a common pin. The pappus is attached to the lower edge of this ring, while over the upper edge fits the corolla and its adhering stamens. The end of the achene—inside the groove—is elongated and to this is attached the pistil.

¹ From the "*Aurora*" for May, a journal conducted by the students of the Iowa Agricultural College. Miss Knapp is a special student in botany, and in this article gives us a glimpse of the kind of work done by Professor Bessey's pupils.—Eds.

Microscopically each filament consists of eight or ten rows of very long parallel cells. On the margins are seen the outward pointed tips of newly developing cells.

A fully grown pappus measures about 25 m. m.; that of a head not yet opened about one-half this length, while one partly opened is three-fourths.

Is the mode of growth by multiplication or by the elongation of the cells? It must be by elongation, for, on measuring the cells of the unopened head, they are found to be only one-half as long as those of the fully grown pappus. The cells of the latter are about one thirty-sixth of an inch or of the entire length.

Besides the change in the cells of the main portion, the marginal ones, which in the very young heads appear as barbs, become greatly lengthened and thus give the plumose or feathery appearance to the pappus

But this elongation is not the only thing that takes place in its development. Each filament, by some action, bends backward until the pappus stands in all directions around the achene.

In order to determine the manner of this action I tried the following simple experiments:

I put on the stove an achene which had not yet fully opened, and therefore had the pappus still adhering. After a moment the pappus began to separate and curve back, the movement showing particularly at the base where it joins the little ring, the marginal cells, also separated, standing out like the vanes of a feather. The whole took about one-half minute, the movements being quick and rather jerking.

Taking the same specimen in which the pappus was now all bent over the achene, I applied a small hair brush, wet in water, to the top of the achene so that the basal cells would be moistened first. These cells began to draw closer to the ring, slowly bringing the pappus from its recumbent position.

Again, upon moistening a piece of dried pappus with alcohol and potash, the marginal cells drew quickly toward the main portion.

Afterwards, in studying specimens of *Mulgedium* and *Lactuca*, I found that the pappus was joined to the achene by two or three rows of small square cells.

From these facts it would seem evident that the lower surface is more susceptible to heat or moisture, contracting in the presence of the latter, and swelling again in the presence of the former; but mainly this movement is due to the small square cells, for by their contraction the pappus moves downward.

On account of this Prof. Bessey proposes for them collectively the name "Carpus," and individually that of "Carpallary cells," because the relation they bear functionally to the pappus is so nearly like that of the carpus to the phalanges.

I would also suggest that the little ring spoken of is a portion of the calyx, for all the species of *Lactuca* examined have a beak or projection to the calyx. This is wanting in the Thistle, or rather has been reduced to a rudimentary form in the shape of this minute ring.

The "Thistledown" or pappus treated of in this article is simply that of *Cnicus altissimus*—our common purple thistle; but its form is characteristic of the genus *Cnicus*. Formerly thistles were placed under *Cirsium*, and *Cnicus* was called a sub-genus, but Bentham and Hooker, in their "Genera Plantarum" have made two distinct genera, taking the different forms of pappus as the ground of distinction. *Cirsium* contains those thistles having barbed pappus, or like the early stage which I have described, while *Cnicus*, or the true thistles, have plumose pappus.
—MINNIE KNAPP, Ames, Iowa.

GENERAL NOTES.

The Fig and the Caprifig.—The relation existing between the wild and cultivated figs has long been a puzzle, and has been variously explained. Graf Solms considers them as two races under one species. Gasparrini describes them as distinct genera. Fritz Müller thinks they are simply male and female plants, and to this view botanists are inclining. The fact that the presence of the caprifig was needed for the best development of the fig, and that the former was inhabited by an insect which visited the latter if possible, has long been known. The operations of this insect are very interesting, and are given in *Nature*, by W. B. Hemsley, as follows:

"The insect that operates in this manner is a small hymenopter, the complete annual cycle of development of which takes place within the three crops of fruit of the caprifig, whilst only one generation visits the fig, and that, as will be seen, to no advantage to the insect itself. In order to render what follows easily understood, we will give the present Neapolitan names of the three crops of the caprifig. The fruits that hang through the winter and ripen in April are called *mamme*. These are followed by the *profichi*, which ripen in June, and the *mammoni*, which ripen in August and September. If we closely examine the *profichi* when fully ripe in June, we see here and there a black-winged insect emerging from the orifice at the top, its hairy body dusted over with pollen grains that have adhered to it in its passage through the zone of male flowers. And if we cut open one of these fruits, we find a considerable number of